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ORIGINAL PAPER

INDIRECT COSTS OF BREAST CANCER IN LITHUANIA IN 2008

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ABSTRACT

Introduction. The costs of breast cancer constitute a huge economic impact on society. Indirect costs associated with breast cancer present a significant challenge to the health care system as well. This is primarily due to temporary and permanent disability, disability allowances and pensions or premature death.

Aim. The objective of this study was to estimate annual indirect costs of breast cancer from a societal perspective in Lithuania for the year 2008.

Materials and methods. A survey of 379 women treated in five major Lithuanian hospitals was conducted in the period of October 2008 – March 2009. Economic data concerning sick-leave and disability due to illness was gathered via survey; data on breast cancer mortality was obtained from the Lithuanian Health Information Center.

Results and Discussion. Productivity loss due to premature death reached €14.280 million, productivity loss due to morbidity amounted to €27.036 million – the major portion of these costs accounted for a production loss due to permanent disability. Temporary disability allowances and permanent disability pensions were estimated at €6.116 million and €8.550 million, respectively.

The paper also highlights the impact of the disease on the whole society and upon survivors personally. Decreasing the production losses due to breast cancer should be emphasized. Effective treatment strategies should be implemented in order to balance the costs of the disease.

Conclusions. Total indirect breast cancer costs, estimated from a societal perspective, reached €55.982 million in 2008 in Lithuania with an average annual amount

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of €5500 per breast cancer patient. Lithuanian budget losses in 2008 due to breast cancer morbidity amounted to €41.7 million, while €14.3 million were associated with premature deaths.

Key words: breast canceer, morbidity costs, mortality costs, cost-of-illnes study.

INTRODUCTION

Breast cancer is the most frequently diagnosed cancer among women worldwide, constituting approximately 23% of all cancer forms. According to WHO reports, over 1 000 000 new cases of cancer are annually diagnosed worldwide. The mean prevalence of breast cancer globally is 66.7 cases per 100 000 women. The highest morbidity is registered in the developed countries – especially in the U.S., whereas in Asian and African countries it is at the lowest level. In the year 2000 there were 350 000 new breast cancer cases in Europe, while the number of deaths from breast cancer was estimated at 130 000. Breast cancer is responsible for 26.5% of all new cancer cases among women in Europe, and 17.5% of cancer deaths [18]. According to the Lithuanian Cancer Registry, the respective number in Lithuania is approximately 1300 cases [11, 18]. Mortality from breast cancer in Lithuania reaches approximately 32 cases per 100 000 of the population.

Most often early-stage breast cancer is diagnosed in the developed countries. For a long time, the following trends predominated in Lithuania: in about 60% of patients – breast cancer was diagnosed in the early stage, and in about 40% of women – in the late stage [8]. Due to the implementation of the mammography screening program these rates have improved by 10% [15].

Increased incidence and declining mortality resulting from effective early diagnostics and modern treatment technologies generate huge expenditures. It is estimated that the costs for breast cancer treatment is increasing constantly and the costs of follow-up medical care, ongoing pharmaceutical needs and recurrences are also predicted to increase [3].

One of the most important tasks in health care system management is to reduce the economic burden of illness. It is obvious that health care system resources should not be allocated on the basis of disease costs, but rather according to the benefits of applied interventions. However, cost-of-illness studies provide essential information for a more thorough health economics evaluation analysis.

Cost-of-illness studies of a specific disease provide information on the cost structure related to that disease for a specific population in a well-defined geographical area (typically a one-year period) [7]. Cost-of-illness studies can track the current costs and predict future costs of the disease, demonstrate if disease requires increased allocation of prevention or treatment resources. They also represent an important

analytical tool in public health policy and may lead to an improved quality of health care [13]. Cost-of-illness study usually includes direct and indirect costs. The term of indirect costs in health economics mainly involves the quantification of lost productivity due to illness, premature retirement and death. This means that we have to deal with the economic impact of disease on society and the national economy.

In breast cancer, indirect costs are substantial and can be significantly larger than direct costs – depending upon the country, they may constitute up to 70% of total costs [9]. Due to the high disease incidence rate in women under 65 years of age and the correspondingly high indirect costs resulting from disability, disability pensions or premature death, indirect costs associated with breast cancer present a significant challenge to the health care systems [4]. Thus, annual cost estimates are very important in evaluating the burden of the disease and educating policy-makers.

Published research for the years 2000–2010 on breast cancer costs vary widely in methodology, perspective, patient populations and time horizon. Some studies have measured all costs of breast cancer [9, 12, 16], other concentrated on breast cancer direct treatment costs [1, 10, 17, 19] and only a few analyzed the indirect burden of illness to society and patients [5, 14]. The latter studies show that indirect costs cover a substantial part of total costs due to disease onset at a relatively young age and related disability.

To our knowledge, there are no studies covering the Baltic states estimating the indirect costs of breast cancer. Such a study would offer valuable information for health authorities concerning the impact of the disease and would serve as part of the framework for upcoming breast cancer economic evaluations.

AIM

The objective of this study was to estimate annual indirect costs of breast cancer from a societal perspective in Lithuania for the year 2008.

MATERIALS AND METHODS

Study type and participants

A cross-sectional observational survey in five major Lithuanian hospitals was conducted from October 2008 to March 2009. Target population and inclusion criteria were as follows: breast cancer patients who attended hospitals or outpatient clinics for treatment or consultations, having been diagnosed with breast cancer at least six months prior to participation in the study. Prevalence based sample size was calculated referring to breast cancer morbidity rates in Lithuania in 2005 (10 178 breast cancer patients in 2005 – the latest information available at the time of the study) and general population size in Lithuania in 2005. Study response rate was 95% – 379 out of 400 randomly chosen women from hospital registries agreed to participate in the study. Instrument used: a self-administered economic data questionnaire, developed by the authors.

Data collection methods

This study estimated indirect breast cancer costs from a societal perspective in Lithuanian for 2008. The costs presented here are annual prevalence-based costs, based on data obtained from the survey, the Lithuanian Health Information Center, the Department of Statistics to the Government of the Republic of Lithuania and the State Social Insurance Fund Board.

The cost-of-illness analysis included an estimation of annual indirect costs from a societal perspective – labor productivity loss due to illness (stemming from early mortality and morbidity). We decided to interpret the concept of indirect costs as follows: the monetary expression of time lost due to treatment, morbidity and mortality.

The study was carried out using the human capital approach, assuming that when a worker is leaving a labor market, productivity is lost until the return to work (in case of temporary disability) or until the end of a working life (in case of permanent disability) and the value of production of an individual is considered at market price [6].

Costing

The data for estimating breast cancer morbidity and mortality costs was gathered from the survey. The estimation of budget losses due to temporary sickness was based on average sickness allowances for 2008 from the same source as above. Then, the survey data was extrapolated to the national level, relying upon breast cancer morbidity data from the National Cancer Registry. The estimation of budget losses due to permanent disability allowances was based on average work incapacity pensions for 2008 from the State Social Insurance Fund Board. The valuation of lost production due to morbidity was based on gross domestic product (GDP) values for Lithuanian inhabitants for 2008.

Morbidity Costs

Morbidity associated costs were assessed by questionnaire in the sample of breast cancer patients. The questionnaire included questions about the breast cancer stage, employment status, permanent disability status, work capacity level, average number of days lost due to breast cancer and others. The obtained data enabled us to calculate the societal burden – annual production quantities that were not created due to illness – lost of GDP value due to decreased activity in the labor market and disability allowances from the State Social Insurance Fund Board due to temporary and permanent disability.

GDP value loss due to temporary disability was calculated in the following way: women of employable age, active in the labor market and missing some days of work due to breast cancer, were identified from the whole survey population – 233 out of 379 (61.48%) were of employable age, 186 out of 233 (79.83%) were employed, and 135 women out of 186 (72.58%) confirmed having sick-leave due to breast cancer. Then, these numbers were extrapolated to the national basis and the presumption was made that 3 625 working breast cancer survivors of employable age might be ex-

periencing sick-leave and missing some days of work due to illness. Next, the average number of missed days per year was multiplied by average GDP value per inhabitant in a year in Lithuania for 2008 (GDP value in 2008 was €9 590).

GDP value loss due to permanent disability was calculated in a similar way: according to survey results, 208 (54.88%) out of 379 women confirmed having permanent disability. 164 women out of 208 (78.78%) were of employable age, and 36 out of 164 (21.95%) were not active in the labor market and not contributing to GDP. Accordingly, survey data was extrapolated to the national level and the presumption was made that 2 234 women of employable age with permanent disability were not active in the labor market in Lithuania in 2008. Then, this number was multiplied by the average GDP value per inhabitant in a year in Lithuania for 2008.

Budget loss due to permanent disability pensions was estimated as follows. According to survey results – 208 (54.88%) out of 379 women confirmed having permanent disability and receiving permanent disability pensions, 161 out of 208 (77.40%) were of employable age. This means that nationally 4 323 breast cancer patients might have had permanent disability in Lithuania in 2008. Next, the sample was distributed according to permanent disability levels. Average pensions due to disability are categorized into three groups: 75–100% of decreased work capacity (I level), 60–70% of decreased work capacity (II level) and 45–55% of decreased work capacity (III level). In 2008 average permanent disability pensions accordingly were €151, €131 and €71 per month. The number of persons with permanent disability in each disability level was multiplied by average disability pensions.

Budget loss due to temporary disability allowances was estimated, based on information about average sick-leave allowances, adjusted by number of workdays missed due to illness and the average female gross wage in Lithuania for 2008 (€585.22). 186 (or 49.08% out of 379) women reported that they were active in the labor market, 135 (or 72.58% out of 186) reported that they missed some workdays during the past month and 75 (55.55%) of them reported that they missed more than 2 days – the rest were excluded from the analysis, because the first 2 days of sick-leave are not covered in the insurance fund. Accordingly, an extrapolated number of 2 774 patients was analyzed. The average number of workdays lost was evaluated using survey results and then the data was extrapolated to the national level. Temporary disability allowances were estimated, controlling the figures by a different allowance range (it depends on the number of workdays missed) and average female gross wage. Also, due to the fact that temporary disability allowances are rewarded from the 3rd day of illness, patients who missed 1 or 2 days in a month, were excluded from the analysis. The remaining data was categorized in two levels: patients, who missed 3–7 workdays (receiving 40% of average monthly wage) and patients, who missed more than 7 workdays (receiving 80% of average monthly wage).

Mortality costs

Data on deaths caused by breast cancer was obtained from the Lithuanian Health Information Center under the Ministry of Health. The total number of breast cancer death cases in Lithuania in 2008 was 602.

Years of potential life lost (YPLL) were estimated. The calculation was based on women's average life expectancy (77 years in Lithuania for 2008). We also estimated the years of potential productive life lost (YPPLL) based on a retirement age of 60, average female wages, standardized by employment rates by age groups in 2008. After the age of 60, YPPLL were not estimated. The total number of deaths including patients who died before the age of 60 in Lithuania in 2008 was adjusted by age groups and employment rates in Lithuania for 2008, and the loss of possible GDP value was estimated by multiplying YPPLL by the average GDP value per inhabitant, per year. Societal costs due to early mortality were estimated by adjusting the number of deaths by female employment rate according to the National Residents Employment Study data. All costs due to early mortality or sickness were estimated as the present monetary value of the lost productive time.

RESULTS

The analysis of production losses due to temporary and permanent disability was intended to be exploratory. The response rate to different questions in individual economics survey ranged from 80 to 95%. For our sample of 379 women, the weighted mean age was 57 (SD ±19) years. Regarding education, 61.5% of the study participants confirmed to have basic education and 25.1% had a university education. Occupation characteristics were distributed in the following way: almost equal numbers of women were identified as full-time employees and retirees – 24% and 31%, respectively. According to breast cancer stage distribution, 76.1% of studied samples were diagnosed with early stage (0–II) and only 23.9% were in an advanced stage (III–IV) of breast cancer.

Morbidity costs (temporary and permanent disability costs)

GDP value loss due to temporary and permanent disability costs was estimated according to estimation methods described in the Costing section. The results of calculations are presented in Tab. 1 and Tab. 2. GDP value loss in 2008 due to temporary and permanent disabilities, reached a total amount of €5.612 million and €21.424 million, respectively.

Tab. 1. Lost GDP value due to temporary disability in Lithuania for the year 2008

Estimated rates	Results
Number of women of employable age, active in the labor market – extrapolated data	4995
Number of employed women, who missed some workdays due to illness during the past month of survey – extrapolated data	3625

Average number of workdays missed – per patient/ per year	58.92
Average GDP per inhabitant in 2008	9590
Average lost state capital due to temporary illness per year – extrapolated data, without discount rate	€5.612 million

Tab. 2. Lost GDP value due to permanent disability in Lithuania for the year 2008

Estimated rates	Results
Number of women of employable age, with permanent disability – extrapolated data	5586
Number of women of employable age, with permanent disability, not active in the labor market – extrapolated data	2234
Average GDP per inhabitant/ per year	9590
Average lost state capital due to permanent disability per year – extrapolated data, without discount rate	€21.424 million

Estimations of budget losses due to temporary disability allowances and permanent disability pensions are presented Tab. 3 and Tab. 4. Annual societal burden of breast cancer in this situation is quite significant, making a total amount of €14.5 million, covered from the State Social Insurance Fund Board. Based on survey data, women, receiving temporary disability allowances due to breast cancer, tend to have a shorter sick-leave – 74.67% of the breast cancer population is absent from work for an average number of 4.88 days per month. Almost €4.5 million per year is paid for temporary disability allowances for a selected group of women missing more than 7 days of work per month.

Tab. 3. Average temporary disability allowances (from the State Social Insurance Fund perspective) due to illness for the year 2008

Number of cases of temporary disability adjusted to number of missed workdays per month due to illness – according to survey (out of 75)	Average temporary disability allowances per person, per year – according to average gross female wage in 2008 (€)	Estimated number of women with temporary disability according to number of missed workdays due to illness per month in Lithuania (out of 2774) – extrapolated data	Average total temporary disability allowances in 2008 – extrapolated data (€)
56 or 74.67%*	760.80	2 071 or 74.67%*	1.578 million
19 or 25.33%**	6455.88	703 or 25.33%**	4.538 million
Total: €6.116 million			

* missing 3–7 workdays per month, 40% salary coverage; ** missing more than 7 workdays per month, 80% salary coverage

Tab. 4. Average permanent disability pensions in Lithuania due to breast cancer, for the year 2008

Number of women with permanent disability due to breast cancer (out of 208) – survey results	Estimated number of women with permanent disability due to breast cancer in Lithuania (out of 5585) – extrapolated data	Assigned disability group, decreased work capacity level (%)	Budget losses due to paid permanent disability allowances (€)
22 (10.58%)	590 (10.58%)	I level (0–25% work)	1.069 million
167 (80.28%)	4483 (80.28%)	II level (30–55%)	7.047 million
19 (9.13%)	509 (9.13%)	III level (60–100%)	433.668
Total: €8.550 million			

Presumably, almost half of all breast cancer patients have been awarded with permanent disability pensions in Lithuania, 2008. The greatest number of them (about 80%) have been assigned with 30–55% work capacity level and received a total amount of €7 million permanent disability pensions per year.

Mortality costs

In Lithuania 602 patients died from breast cancer in 2008. The distribution of deceased breast cancer patients by age in Lithuania in 2008 revealed that most of deaths occurred in patients aged 45–64 years (242 or 40.2%). A woman's average life expectancy was 77 years in Lithuania in 2008 [23]. Considering the total number of life years lost due to premature death from breast cancer, the YPLL were estimated. The number of YPLL constituted an average of 12.5 years for each prematurely dead breast cancer patient. The total number of YPLL reached 7526 in Lithuania for 2008. Calculating YPLL, all premature deaths of employment age were included in the analysis, starting from the death at the youngest age (the youngest productive person who died from breast cancer in 2008 was 31 years old), and ending with the age of legal retirement (60 years old). After the age of 60, YPPLL were not estimated. The total number of deaths including patients who died before the age of 60 in Lithuania in 2008 was 201.

Indirect costs due to early mortality were estimated by adjusting data by female occupation rates in certain age groups. This is essential, because not all persons with breast cancer at an employable age are active in the labor market. According to our study, the employment rate decreased with increasing age – about 82% of women of employable age were active in the age group 30–49, but only 65% were working in the age group of 55–59 years. For breast cancer, average additional indirect costs due to premature mortality adjusted by employable age, employment rate within age groups in Lithuania, 2008 (data from the Department of Statistics to the Government of the

Republic of Lithuania) were 9.86 YPPLL and €69 249 per patient. The total number of deaths adjusted by occupation rate within age groups reached 151, forming a total amount of 1489 YPPLL. The monetary value of these results is presented in Tab. 5.

Tab. 5. Indirect costs due to early mortality from breast cancer in Lithuania in 2008

Estimated rates	Results
Number of deaths of women of employable age	151
YPPLL – calculated till the end of employable age of 59 years, adjusted by occupation rate within age groups	1489
Average GDP per inhabitant in 2008 (€)	9590
Production loss due to premature death (€)	14.280 million

Total indirect breast cancer costs in Lithuania reached €55.982 million in 2008 and an average annual amount of €5 500 per breast cancer patient (Tab. 6). Productivity loss due to morbidity had the most significant impact on the structure of costs, forming about 50% of all indirect costs.

Tab. 6. Indirect costs due to breast cancer in Lithuania for 2008

Source of indirect costs	Average indirect costs for Lithuanian breast cancer population – extrapolated data, discounted value of money (€)
Productivity loss due to premature death	14.280 million
Productivity loss due to morbidity	27.036 million
Budget loss for temporary disability allowances	6.116 million
Budget loss for permanent disability pensions	8.550 million
Total: €55.982 million	

DISCUSSION

This is the first breast cancer economic evaluation in Lithuania. This study calculated annual additional indirect costs from a societal perspective in Lithuania for 2008. Our analysis, based on different data sources, quantified the socio-economic impact of breast cancer. The study followed the most common definitions of indirect costs, used in health economics theory. We recognize a variety of methodological difficulties and limitations in the study. The evaluation of indirect costs due to permanent and temporary illness might have been estimated more accurately if the data had

been obtained from the National Social Security Fund information system instead of the survey. Also, in order to estimate unbiased additional indirect costs of work absence due to disease, it would be advisable to compare the production loss of the breast cancer population with the standard population. The representative sample studied was based on women who were treated or consulted in hospitals during the time of the study, omitting patients from nursing homes – therefore, some limitations to precise sample sizing may be possible.

According to our study, total indirect breast cancer costs in Lithuania reached €55.982 million. Budget losses from a societal perspective associated with breast cancer morbidity were three times higher than those associated with premature deaths (€27.036 million and €14.280 million, respectively). Budget losses due to temporary disability allowances and permanent disability pensions accounted for the total amount of €14.5 million. The major part of the money spent on temporary disability allowances is paid to patients missing more than 7 days of work per month – almost €4.5 million per year are spent from the budget for this reason. This might be explained by the fact that the surveyed women, active in the labor market, and having a sick-leave for more than 7 days, reach an average number of 20.26 days missed from work. Early diagnostics, modern cancer treatment technologies and health care system organization should assist in improving this situation, by enabling women to reach a better health status and to live full-quality lives in an occupational sense as well.

Our study results highlighted the fact that breast cancer GDP value loss due to permanent disability in Lithuania in 2008 was four times higher than the loss due to temporary disability. There might be a reason explaining this situation: breast cancer survivors assigned with permanent disability level and not working at all, were not creating production for the whole year, meaning that the losses were increasing day to day.

It is very difficult to compare the study results with other studies due to differences in methodologies used, breast cancer population size and socio-economic settings. Studies, estimating indirect costs of breast cancer revealed the following results: amount of $1.15 billion for premature mortality losses was stated for California in 2001 [12], €288.73 million associated with total indirect costs (costs of premature mortality, temporary and permanent illness included) for Spain in 2003 [14], and estimations at 2.1 billion kronors for breast cancer indirect costs for Sweden in 2001 [9]. Indirect costs per one breast cancer patient in different studies range from $4221 in Australia in 2005 [5] up to €15 903 in Flanders during 1998–2003 [2] and €5500 according to our analysis. The study, performed in Flanders, revealed that the average number of workdays lost due to disease, was 47.2 per patient/ per year, and 58.9 days respectively according to our analysis. Costs, estimated in our analysis, may be used for determining priorities in health care policy and may serve as a framework for further economic evaluation. The paper highlights the impact of the disease on the whole society and upon survivors personally. Decreasing the production losses

due to breast cancer should be emphasized. Effective treatment strategies should be implemented in order to balance the costs of the disease.

CONCLUSIONS

Total indirect breast cancer costs, estimated from a societal perspective, in Lithuania, reached €55.982 million in 2008 with an average annual amount of €5500 per breast cancer patient. Budget losses in 2008 due to breast cancer morbidity were €41.7 million, while €14.3 million were associated with breast cancer premature deaths.

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